16. (Amended) The image forming process according to claim 13, wherein the fixing apparatus comprises a heat roller and a pressure roller and the heat roller has a surface temperature from 150 to 180°C.

17. (Amended) The image forming process according to claim 13, wherein fixing apparatus comprises a heat roller and a pressure roller, and the heat roller and the pressure roller have a peripheral transferring speed of from 70 to 120 mm/second.

19. (Amended) The image forming process according to claim 13, wherein the fixing apparatus has a heat roller and a pressure roller, each of the heat roller and the pressure roller having an elastic layer and a surface layer on a core surface in this order, and the elastic layer having a rubber hardness of from 10 to 40 degrees by Asker and wherein the elastic layer comprises a releasing resin.

REMARKS

Claims 1-20 are pending herein. By this Amendment, the specification and claims 13, 15-17 and 19 are amended. Support for the Amendment of the specification can be found, for example, in claim 13 originally filed. Support for the amendment of claims 13, 15-17 and 19 can be found in the specification, for example, at page 2, lines 17, and from page 23, line 20 to page 24, line 3. Thus, this amendment does not introduce new matter.

The attached Appendix includes marked-up copies of each rewritten paragraph (37 C.F.R. §1.121(b)(1)(iii)) and claim (37 C.F.R. §1.121(c)(1)(ii)).

Entry of the amendments and the attached Declaration is proper under 37 CFR §1.116 since they: (a) place the application in condition for allowance for the reasons discussed herein; (b) do not raise any new issue requiring further search and/or consideration since the amendments amplify issues previously discussed throughout prosecution; (c) satisfy a requirement of form asserted in the previous Office Action; (d) do not present any additional claims without canceling a corresponding number of finally rejected claims; and (e) place the

application in better form for appeal, should an appeal be necessary. The amendments and the attached Declaration are necessary and were not earlier presented because they are made in response to arguments raised in the final rejection. Entry of the amendments and the attached Declaration is thus respectfully requested.

Applicants thank the Examiner for the indication that claims 1-6 and 12 are allowed, and that claim 11 is only objected to. For all of the reasons set forth below, all of claims 1-20 are believed to be in condition for allowance.

I. Objection to the Specification

The Office Action objects to the specification for various informalities. Applicants have amended the specification to correct the informalities identified in the Office Action.

In particular, the Office Action objects to Examples 6 and 7 and Comparative Examples 4, 5 and 7 for including either WAX D or WAX E, which are allegedly not specifically identified in the specification. Applicants respectfully submit that WAX D and WAX E are described in the specification. However, due to a typographical error in the Table in which WAX D and WAX E are described, the waxes are incorrectly designated. As amended, Table 6, at page 39, correctly designates the waxes as WAX C, WAX D and WAX E. This is an obvious error, as WAX A and WAX B are described in Table 5, and the examples following Table 5 clearly refer to the waxes of Table 5. As such, it would have been clear to one skilled in the art that the reference to waxes A-C in Table 6 was in error, as the examples described following and with reference to Table 6 refer to waxes C-E.

The Office Action also notes that the specification at page 45, line 24, and page 46, line 7, indicates that the differential molecular weight of 1×10^6 larger than 0.15%, which appears to contradict the indication of differential molecular weight of 1×10^5 larger than 0.15% in Table 7 on page 43. The specification is amended to indicate a differential molecular weight of 1×10^5 larger than 0.15% at page 45, line 24, and page 46, line 7.

In addition, the Office Action observes that the specification, at page 8, line 10, states that the toner image has a glossiness of from 40 to 50, while at page 26, line 15, the specification indicates that the fixed image has a glossiness of from 40 to 60. The specification is amended to indicate that the glossiness has a range from 40 to 60 with a preferred range of 40 to 50.

The Office Action also objects to the specification as failing to provide proper antecedent basis for the subject matter of claim 13. In particular, the Office Action asserts that claim 13 specifies a "fixing apparatus" and "releasing resin," both of which are broader than the disclosed examples in the specification. The specification is amended to recite fixing apparatus and releasing resin at pages 7 and 24 as appropriate.

Finally, the Office Action objects to the specification as allegedly omitting essential subject matter that is necessary to describe and enable the claimed invention. In particular, the Office Action objects to the lack of any indication as to how the Asker C rubber hardness of a pressure roller and a heat roller are determined. The Office Action asserts that there is more than one standard by which Asker C hardness can be determined. Thus, as such, the Office Action asserts that the disclosure is inadequate to inform one skilled in the art of how to make and use the claimed invention.

Applicants respectfully disagree with the Office Action's assertion. Applicants submit that one skilled in the relevant art would understand and be aware of the methods by which the Asker C hardness of a compound can be determined. One exemplary method for determining the Asker C value is described in the manuals for a durometer (copies enclosed). As the manual shows, the method used to determine hardness does not vary significantly between the different hardness scales. Thus, the indication of that it is the Asker C value that is being determined is sufficient to communicate to one of ordinary skill in the art the particular method used in determining the Asker C value. As such, the disclosure provides sufficient guidance for one skilled in the relevant art to make and use the claimed invention.

Thus, contrary to the assertion of the Office Action, the disclosure does not omit essential subject matter.

In view of the amendment of the specification and the above comments, Applicants submit that this objection should be withdrawn. Reconsideration and withdrawal of the objection are respectfully requested.

II. Rejection under §112, Second Paragraph

Claims 13 and 15-19 are rejected under 35 U.S.C. §112, second paragraph, as allegedly indefinite. Applicants respectfully traverse this rejection.

Claims 13 and 15-19 are amended to more clearly indicate structural features of the claimed invention and to provide proper antecedent basis for ceartin features in the claims. In view of the amendment of claims 13 and 15-19, this rejection should be withdrawn.

Reconsideration and withdrawal of the rejection are respectfully requested.

III. Rejection under §112, First Paragraph

Claims 18 and 19 are rejected under 35 U.S.C. §112, first paragraph, as allegedly not enabled by the specification. Applicants respectfully traverse this rejection.

Applicants respectfully submit that the claims are fully enabled by the specification. One skilled in the relevant art would not need to know the specific method by which the Asker C value was determined, only the actual value because the actual value obtained would not be expected to vary based on the method used. As discussed above, with respect to the objection to the disclosure, the specification does enable claims 18 and 19. One skilled in the art would be able to readily determine and understand the method by which the Asker C hardness value of the composition was determined. The attached copies of the durometer manuals clearly show that the method by which various hardness scales does not vary, and that the indication of Asker C values specifies a particular set of established conditions for determining the Asker C value.

In view of the above comments, Applicants respectfully submit that claims 18 and 19 are fully enabled by the specification. Reconsideration and withdrawal of the rejection are respectfully requested.

IV. Rejection under §103

Claims 7-10 are rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Shimojo (US 5,250,382) and Nanya (US 5,079,123). Applicants respectfully traverse this rejection.

The Patent Office cites Shimojo for teaching a two-component developer comprising a binder resin having a domain-matrix structure (see e.g., Example 31 of Shimojo). The domain resin of Example 31 has a Mw of 12,000 and a ratio of Mw/Mn of 2.4. The matrix resin of Example 31 has a Mw of 21,000 and a ratio of Mw/Mn of 3.1, and is in a weight ratio of 50:50 with the domain resin.

The Patent Office alleges that the claimed properties recited in claim 7 of the present application would be presumed present based on the composition of the binder resin of the Shimojo developer, as the domain and matrix resins taught by Shimojo fall within the limitations of resins (A) and (B) of instant claim 8. Applicants respectfully disagree with this assertion.

As shown in the attached Declaration, based on the molecular weight and weight ratios of the developer described in Example 30 of Shimojo, the developer does not meet the claimed values for the differential molecular weight distribution of 5×10^3 or 1×10^5. The results show that the ratio of differential molecular weight distribution of 5×10^3 (%) is 0.569 for Shimojo Example 30. In addition, the Declaration also shows that binder resin 28, and comparable binder resins 39 and 40, of Shimojo would also fail to meet the claimed values for the ratio of differential molecular weight distribution of 5×10^3 (%) as claimed. The ratio of differential molecular weight distribution of 5×10^3 (%) would be even greater than that

observed in the developer of Example 30 because of the toners of binder resins 28, 39, and 40 would have molecular weights that are greater than that of Example 30.

Further, by admission of the Patent Office, it is pointed out that Shimojo fails to disclose a toner having the molecular-weight-by GPC properties of the THF-dissolved components of the present invention. Shimojo also fails to teach or suggest the presence of a wax, as required in claim 7.

Nanya fails to remedy the deficiencies of Shimojo. Nanya was merely relied upon as teaching the advantages of using a conventional carnauba wax. However, Nanya fails to remedy the deficiencies of Shimojo as set forth above.

For the foregoing reasons, Applicants submit that Shimojo and Nanya, whether taken singly or in combination, fail to teach or suggest the present invention. Reconsideration and withdrawal of the rejection are respectfully requested.

For at least these reasons, claims 7-10 would not have been obvious over the cited references. Reconsideration and withdrawal of the rejection are respectfully requested.

V. Conclusion

In view of the foregoing amendments and remarks, Applicants submit that this application is in condition for allowance. Favorable reconsideration and prompt allowance of the pending claims are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in better condition for allowance, the Examiner is invited to contact Applicants' undersigned representative at the telephone number set forth below.

Respectfully submitted,

James A. Oliff
Registration No. 27,075

Stephen Tu
Registration No. 52,304

JAO:SXT/amw

Attachments:
Appendix
References (2)
Declaration Under 37 C.F.R. §1.132

Date: February 24, 2003

OLIFF & BERRIDGE, PLC
P.O. Box 19928
Alexandria, Virginia 22320
Telephone: (703) 836-6400

DEPOSIT ACCOUNT USE AUTHORIZATION
Please grant any extension necessary for entry;
Charge any fee due to our Deposit Account No. 15-0461

APPENDIX

Changes to Specification:

Page 6, line 24 to page 7, line 6:

The 4th aspect of the invention is an image-forming process including a latent image-forming step of forming an electrostatic latent image on a latent image holding member, a developing step of forming a toner image by developing the electrostatic latent image with a toner, a transfer step of transferring the toner image onto a transfer material to form a transfer image, and a fixing step of fixing the transferred image using a fixing apparatus comprising, for example, a heat roller and a press roller. The toner is that described in the aspect 1 or 2 above, the surfaces of the heat roller and the press roller are formed of a releasing resin such as, for example, a fluorine resin, and a releasing liquid is not substantially supplied to the surfaces.

Page 8, lines 8-10:

The 11th aspect of the invention is the image-forming process described in the aspect 4 described above. When the toner amount on the recording paper is 0.50 mg/cm^2 and the glossiness (75 degree gloss) is from 40 to 60, and preferably 40 to 50.

Page 23, line 21 to page 24, line 3:

The image-forming process of the invention is an image-forming process including a latent image-forming step of forming an electrostatic latent image on a latent image holding member, a developing step of forming a toner image by developing the electrostatic latent image with a toner, a transfer step of transferring the toner image onto a transfer material to form a transfer image, and a fixing step of fixing the transfer image using a fixing apparatus comprising, for example, a heat roller and a press roller, wherein the above-described toner is the toner of the invention, the surfaces of the above-described heat roller and press roller are formed with a releasing resin such as, for example, a fluorine resin, and a releasing liquid is not substantially supplied to the surfaces.

Page 26, lines 5-18:

In the image-forming process of the invention, fixed images having a high glossiness can be obtained. Because the glossiness of a fixed image largely depends upon the structure of the fixing apparatus and the fixing condition, it is difficult to obtain a high gloss by satisfying all the conditions but in the present invention, a high glossiness can be obtained by the following conditions. That is, in the invention, in the state of substantially not supplying a releasing liquid to the surface of the heat roller, using a recording paper having a basis weight of from 50 to 120 g/m^2 as the recording material, and when the toner image is fixed to the recording paper by heat-pressing under the conditions that the surface temperatures of the heat roller and the press roller are from 150 to 180°C and the peripheral speed of the heat roller and the press roller is from 70 to 120 mm/second, a fixed image having a glossiness (75 degree gloss) of from 40 to 60, preferably 40 to 50, can be formed when the toner carried amount formed on the recording paper is 0.50 mg/cm^2. The image having such a high glossiness is suitable for a pictorial image and an OHP image and gives a fill color image having a high quality.

Page 39, in the Table:

Table 6

	Contents of Wax	Melting Point (°C)	Melt Viscosity at 110°C (mPa•s)
Wax ~~A~~C	Granular purified carnauba wax	83	50
Wax ~~B~~D	Microcrystalline wax	85	110
Wax ~~C~~E	Heptatriacontanole oxalate	103	150

Changes to Claims:

The following is a marked-up version of the amended claim(s):

13. (Amended) An image forming process comprising a step of forming an electrostatic latent image on a latent image holding member, a step of forming a tone image by developing the electrostatic latent image with a tone, a step of transferring the toner image onto a transfer material to form a transfer image, and a step of fixing the transferred image using a fixing apparatus comprising at least one roller, wherein the toner is the electrostatic latent developing toner described in claim 1, ~~the~~and wherein a surface layer of the ~~fixing apparatus having~~at least one roller comprises a releasing resin, and a releasing liquid is not substantially supplied to the surface layer of at least~~thereof~~.

15. (Amended) The image forming process according to claim 13, wherein when an amount of the toner image formed on the latent image holding member~~recording material~~ is 0.50 mg/cm^2, the toner image having a glossiness (75 degree gloss) of from 40 to 60.

16. (Amended) The image forming process according to claim 13, wherein the fixing apparatus comprises~~having~~ a heat roller and a pressure roller and the heat roller ~~having~~has a surface temperature from 150 to 180°C.

17. (Amended) The image forming process according to claim 13, wherein fixing apparatus ~~having~~comprises a heat roller and a pressure roller, and the heat roller and the pressure roller ~~having~~have a peripheral transferring speed of from 70 to 120 mm/seconds.

19. (Amended) The image forming process according to claim 13, wherein the fixing apparatus has a heat roller and a pressure roller, each of the heat roller and the pressure roller having an elastic layer and a surface layer on a core surface in this order, and the elastic layer having a rubber hardness of from 10 to 40 degrees by Asker and wherein the elastic layer comprises a releasing resin.

ASKER

RUBBER HARDNESS TESTER (DUROMETER)

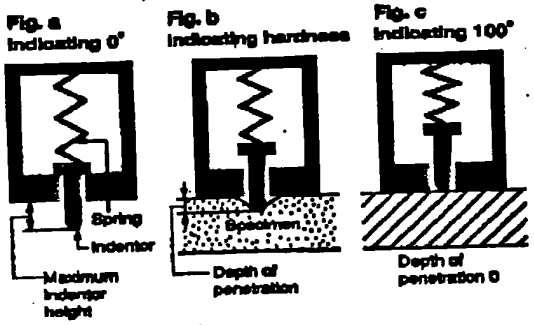
INSTRUCTION MANUAL

KOBUNSHI KEIKI CO., LTD

Thank you for purchasing the ASKER Rubber Hardness Tester. This hardness tester which has thus far been known as a machine for measuring the hardness of rubbers, etcs. (also called as a spring type hardness tester or durometer) is easy to handle and permits jiffy measurement and is therefore widely used but for exact measurement, care must be taken for a number of points. This instruction manual gives explanation on how to correctly use this hardness tester together with the necessary precautions to be taken. (The paragraph 2. "How to Measure Hardness" described in this manual is not applicable to the Hardness Tester Type F. A separate instruction manual for the method of measuring hardness with the Type F is available.)

1. How Hardness is Measured

This hardness tester is designed to measure the hardness of a test specimen from the "depth of penetration" of the indentor in the state of the balance between the resistance force of the specimen and the force of a spring (Fig. b) when the indentor of the predetermined geometry is pressed to the surface of the specimen by the force of the spring and the specimen is indented. The hardness tester is equipped with the indicating mechanism which reads the depth of penetration from the scale graduating, at equal intervals, the depth of penetration from the depth of penetration –maximum height of the indentor (namely the displacement of the indentor is zero-Fig. a) for 0 degrees and zero depth of penetration (Fig. c) for 100 degrees. The load applied from the indentor to the specimen is not constant as the force by the deflection of the spring is used, thus the load changes linearly between zero degrees to 100 degrees.



A number of kinds of hardness testers are specified in the requirements specified in JIS, ASTM, etc. and the details are determined with respect to the "shape of indentor", "the force to be applied to the indentor by spring", etc. for the respective hardness testers.

We manufacture various kinds of hardness testers in addition to the hardness testers mentioned above so that the hardness of a wide range of materials can be measured.

AVAILABLE TYPES OF ASKER RUBBER HARDNESS TESTERS

Model	Principal Standards	Indentor Design [mm]		Spring Load [mN(g)]		Measuring objects	Size & Shape of the presser foot[mm]
		Height	Shape	0 Degree	100 Degree		
A(AL)	JIS K 6253 JIS K 7215 ASTM D 2240 ISO 7619 ISO 868 (Durometer Type A)	2.50	35-Deg. Truncated Cone 0.79	550 (56)	8050 (821)	Normal rubber (for recessed part)	44×16 (rectangular)
D	JIS K 6253 JIS K 7215 ASTM D 2240 ISO 7619 ISO 868 (Durometer Type D)		30-Deg. Cone Tip Radius 0.1	0 (0)	44450 (4535)	Hard rubber	
E	JIS K 6253 (Durometer Type E)		2.50 Radial Hemisphere	550 (56)	8050 (821)	Soft and cellular rubber	
JA	JIS K 6301 (Type A)	2.54	35-Deg. Truncated Cone 0.79	539 (55)	8379 (855)	Normal rubber	
B	ASTM D 2240 (Durometer Type B)	2.50	30-Deg. Cone Tip Radius 0.1	550 (56)	8050 (821)	Semi-hard rubber	
ASKER C	JIS K 7312 SRIS 0101	2.54	5.08 Diameter Hemisphere	539 (55)	8378 (855)	Soft and cellular rubber, textile windings	
ASKER Cs	ASKER Cs			539 (55)	4460 (455)	Soft sponge	
ASKER CS	ASKER CS		10 Diameter Circular Cylinder	980 (100)	44100 (4500)	Polystyrene foam	80 Diameter (Circular)
ASKER FP	ASKER FP		15 Diameter Circular Cylinder	980 (100)	1960 (200)	Powder puff	50×37 (Oval)
ASKER F	ASKER F		25.2 Diameter Circular Cylinder	539 (55)	4460 (455)	Foam rubber, plasti foam	80 Diameter (Circular)

2. H w to Measure Hardness

You hold the tester perpendicularly with both hands, press the pressor foot (th surface from which the indentor xtends) of the tester to the surface of the test specimen and read the position of the pointer on the scale plate at that time (or a few seconds after) from the front of the tester. The measurement is basically as simple as above but the following precautions must be observed to improve the accuracy of measurement.

1) The specimen must be free from mechanical stresses and must have the smooth surface free from undulation, waviness, etc. (Undulations of 0.025 mm lead possibly to an indication error of maximum 1 degree.) The measuring surface of the specimen is preferably larger than the size of the pressor foot of the tester (18 × 44 mm; however, a diatester 12 mm with the type AL and diatester 50 mm with the type CS). The thickness of the specimen must be at least 6 mm or larger with the types JC, D and CS and be at least 12 mm or larger with other types. The specimen thinner than these is measured in some cases after the specimens are laminated up to these thicknesses for the sake of conveniences but care must be exercised in such a case not to leave air layers between the respective layers of the specimen.
The measurement of the specimen that does not meet the above-mentioned conditions is also possible but the measured value in this case should be used only as the data for comparison of hardness under the determined constant conditions (the thickness and shape of the specimen, the condition of the object with which the specimen contacts, etc.)
2) The force for pressing the tester to the specimen varies with the types of the testers.

Type A, AL, E, JA, JAL, B, C and Cz:
Lightly press the pressor foot to the specimen surface under the force of 1 to 1.5 kg with the feel of providing a uniform contact between the pressor foot and the sample surface. Be careful with the soft specimen as the hardness measured will be higher than the true hardness if the specimen is pressed with the excessive force.

Type D, JC, and CS:
With these testers, the specimen is required to be pressed strongly under the force of over 5 kg as the springs of large force are used. An error may be produced from the insufficient pressing force particularly with the hard specimen.

3) The tester may fail to make correct indication if the tester is inclined forward or backward or is pressed to the specimen in the state of holding the tester by one hand or when the pressing direction deviates considerably from the perpendicular axis of the specimen.
4) If the same area of the specimen is measured continuously, the indication will decrease gradually. This sh uld be avoided by making measurement after lapse of suitable time or measuring the hardness at the point apart by more than 6 mm from the point previously measured. The indication will be lower in the part near the periphery of the specimen as the resistance of the specimen to the indentor is lower in this part. The measurement must therefore be made at the point inner by more than 12 mm from the periphery of the specimen.
5) The high speed of pressing the tester to the specimen results in a higher indication and the low speed in a lower indication and therefore the tester must be pressed to the sample at the constant speed as far as possible. The measurement value to be obtained varies also with whether the position of the pointer is read at the maximum value, is read at the value right after pressing or is read upon lapse of some seconds after pressing. Thus, these conditions must be determined constant. These conditions are particularly carefully noted for any material with which stress relaxation appears (such a material with which the indication falls right after the indentor is pressed to the material surface). (A maximum pointer type hardness tester is also available from us for sure reading of the maximum value or for measurement when the reading from the front of the tester is difficult.)

3. Maintenance

The following precautions must be taken for the daily use and maintenance of this tester:

1) Keep the tester free from shock and impact during handling.
2) Use or store the hardness tester desirably in a place where moisture is low and less dust and oil vapor exist. Do not oil any part of the tester.
3) When reusing the tester after long storage, make "idle pressing" about 20 times prior to the measurement.
4) Before use, be sure to confirm that the pressor foot and the indentor are free from any deposit and that the indentor foot is free from any damage that may impair the hardness measurement.

4. Periodic Inspection

The hardness tester requires periodic inspections according to the frequencies of its use. If the tester is frequently used every day, make inspection at least once every three months by the procedures shown in the table below. An "indentor height gage" is manufactured by us for use as an instrument for inspections of 2, and 4 shown in the table and a "load checker" is also manufactured by us for inspection of 5. These implements will make your inspection easier and more reliable. The hardness tester which is rejected as a result of the inspection requires adjustment and repair and must therefore be returned to us.

PERIODIC INSPECTION OF ASKER RUBBER HARDNESS TESTER

Sequence	What to Inspect	How to Inspect	Remarks
1	If the shape of indentor is normal.	Check by using a profile projector, etc. to see if the size and shape of the indentor are within the specified permissible range.	This check can be omitted if the indentor is considered to have no wear and deformation.
2	If the pointer is correctly installed to the pointer shaft.	Substantially press the presser foot to a smooth surface and check if the pointer indicates 100±1.	
3	If the maximum indentor height is correct.	Check if the pointer indicates 0±1 when the displacement of the indenter is zero.	
4	If the indicating mechanism indicates the displacement of indentor correctly.	Apply the displacement to each indication to the indentor and check if the pointer indicates the specified value ±1.	Usually check at 3 points, 2, 50 and 100.
5	If the load characteristic of the spring is correct.	Apply the load corresponding to each indication to the tip of the indentor and check if the pointer indicates the specified value ±1.	Usually check at 3 points, 25, 50, 75.

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HOME PAGE http://www.asker.co.jp/ e-mail asker@asker.co.jp

ASKER

HARDNESS TESTER FOR RUBBER AND PLASTICS

[redacted] tester is an instrument to quantify the sense of hardness or softness we experience by physical method. A spring load is pressed through a small indentor against a specimen surface to deform, thus providing a measure of 'hardness' corresponding to the depth of indentation below the specimen surface where the reaction of the specimen and the spring load reach equilibrium.

KOBUNSHI KEIKI CO., LTD.

ASKER

LIST OF ASKER RUBBER HARDNESS TESTERS

One of the most important steps in using a rubber hardness tester is to select the optimum type. There are various types of rubber hardness testers available based on different standards applied to a wide variety of subjects to be measured.

Among them the most popular models for rubber materials are JIS K 6253-specified Type A Durometer(ASKER Model A) and JIS K 6301-specified Type A Hardness Tester(ASKER Model JA).

Other typical models include ASTM D 2240-specified Type D Durometer(ASKER Model D) for hard rubber and the ASKER Model C for soft rubber or flexible cellular materials.

On the other hand, ASTM D 2240-specified Type A and D hardness tester will be increasingly used for international trade because of conforming with ISO.

A(AL)	JIS K 6253 JIS K 7215 ASTM D 2240 ISO 7619 ISO 868 (Durometer Type A)	2.50	35-Deg. Truncated Cone 0.79	550 (56)	8050 (821)	44×18 (Rectangular)	Width 87 Depth 30 Height 76	200
D	JIS K 6253 JIS K 7215 ASTM D 2240 ISO 7619 ISO 868 (Durometer Type D)		30-Deg. Cone Tip Radius 0.1	0 (0)	44450 (4533)			
E	JIS K 6253 (Durometer Type E)		2.5 Radial Hemisphere	550 (56)	8050 (821)			
JA	JIS K 6301 (Type A)	2.54	35-Deg. Truncated Cone 0.79	539 (55)	8379 (855)			
B	ASTM D 2240 (Durometer Type B)	2.50	30-Deg. Cone Tip Radius 0.1	550 (56)	8050 (821)			
ASKER C	JIS K 7312 SRIS 0101	2.54	5.08 Diameter Hemisphere	539 (55)	8379 (855)			
ASKER C2	ASKER C2			539 (55)	4480 (455)			
ASKER CS	ASKER CS		10 Diameter Circular Cylinder	980 (100)	44100 (4500)	50 Diameter (Circular)	50×50×76	250
ASKER FP	ASKER FP		15 Diameter Circular Cylinder	980 (100)	1960 (200)	50×87 (Oval)	50×87×81	300
ASKER F	ASKER F		25.2 Diameter Circular Cylinder	588 (55)	4480 (455)	80 Diameter (Circular)	80×80×81	500

Indentor Design

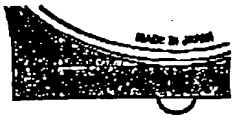
Conical Design

Cone point type.
Model B and D have this type.
Measuring objects:
Hard rubber and plastics

Truncated Cone Design

Flat point type.
Model A and JA have this type.
Measuring objects:
Normal rubber

Hemispherical Design



Hemispherical point featuring larger contact area. ASKER Model C is included in this type.
Measuring objects:
Soft rubber and sponge

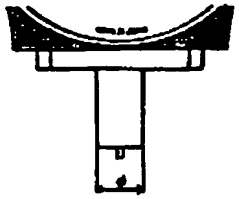
Cylindrical Design

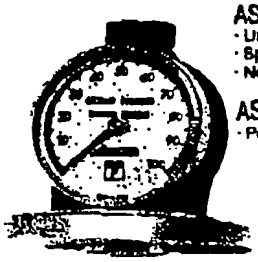
This type allows an extended specimen surface area to be pushed. Model F, FP, and CS have this type.
Measuring objects:
Urethane foam, sponge, and polystyrene foam

Long Presser Foot Type

This features a longer presser foot, allowing measurement of narrow measurement objects of those having recessed sections.

Model AL, DL, and BL (ϕ = 12mm)
Model EL, C1L, and C2L (ϕ = 16mm)
Model JAL (ϕ = 10mm)





ASKER Model F

- Urethane foam
- Sponge
- Non-woven fabric

ASKER Model FP

- Powder puff

Exclusive type for foam materials, allowing measurement by placing the tester on the object of measurement.
In addition to Model F, Model FP is available for powder puff.

ASKER Model CS

- Polystyrene foam

This features larger indentor and a more strong spring compared to ASKER Model C, thereby making it more suitable for polystyrene foam.

ASKER Model C

ASKER Model C2

- Soft rubber
- Sponge
- Textile windings
- Rolled films
- Potter's clay

ASKER Model C is intended for hardness measurement of soft rubber, sponge, textile windings, rolled films, potter's clay, and other such soft materials.
For even softer materials, Model C2 is available.

DESCRIPTION OF SPRING-TYPE RUBBER HARDNESS TESTERS(DUROMETERS)

Measurement of hardness is one of the essential factors for determining characteristics of various rubber, elastomers, and plastic products.
Featuring portable design, ease and simplicity of operation, and nondestructive measurement, the spring-type rubber testers (durometers)have been in widespread use.

The operational principle is shown in Fig.1.
An indentor is pressed against the surface of a specimen with the force of a spring load and the indented depth of the point is measured when the reaction of the specimen and the spring load reach equilibrium, thus providing a measure of hardness.

As shown in Fig.2, hardness is indicated on a dial scale of equal divisions from 0 to 100, called hardness value.
Expression of hardness is often specified by relative standards. For details, refer to the table entitled; 'Various Hardness Test Methods, Hardness Testers Used, and Hardness Data Expression According to Different Standards' listed later in this brochure.

Fig.①

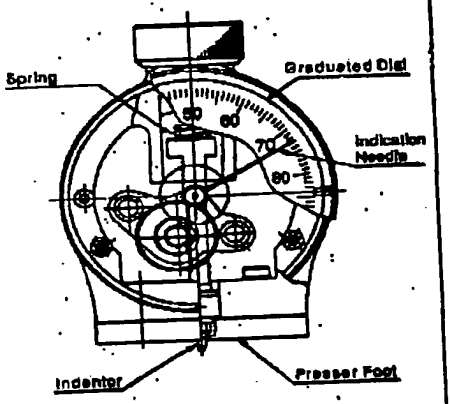
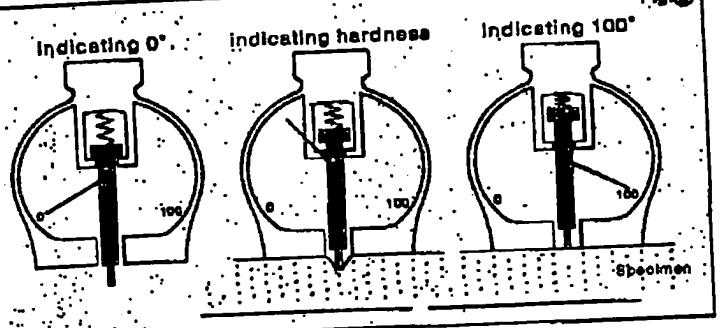


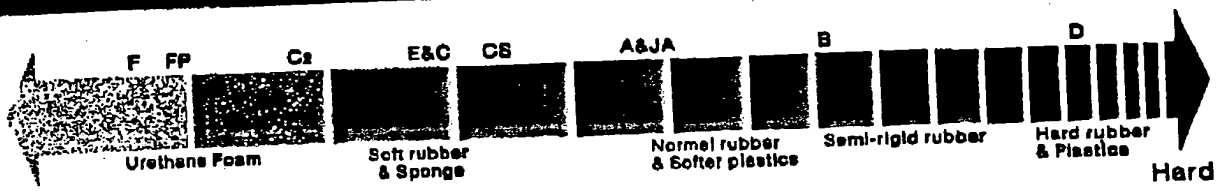
Fig.②



Notes for Measuring Hardness

(1) Bear in mind that measured results are influential with ambient temperature and humidity.
(2) For best results, test specimen must have smooth surfaces without any irregularity, warp, or waviness.
(3) When measuring at multiple points on one specimen, allow an minimum interval of 6mm between measurement points. In addition, ensure that measurement points are at least 12mm from the edges of the specimen, as specified in domestic and international standards.
(4) Measured results are influential with the speed of pressing of indentor against a specimen. For optimum measured results pay attention to use a constant point pressing speed.

HARDNESS TESTER SELECTION CHART



ASKER Model E
- Soft rubber
- Sponge

This model is defined as 'Durometer Type E' as described in JIS K 6253.
Similar to ASKER Model C, available for soft and cellular rubber.

ASKER Model A
- Normal rubber

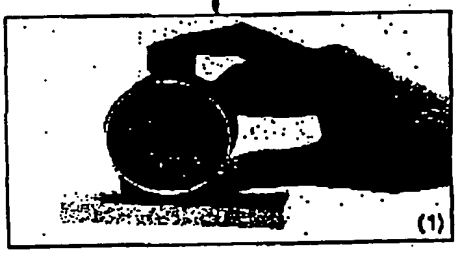
The most popular type for normal rubber all over the world, standardized in JIS K 6253, ISO 7619, ASTM D 2240, etc.

ASKER Model JA
- Normal rubber

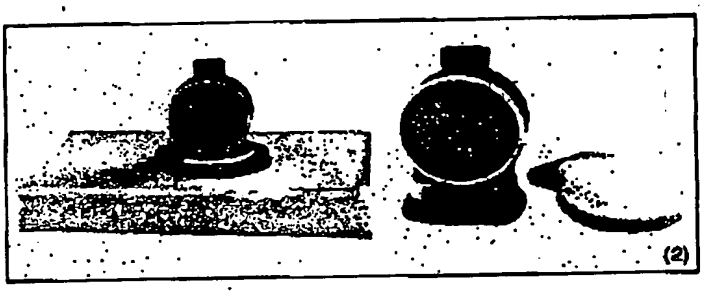
A hardness tester which conforms with the former JIS K 6301. So far, one of the most popular types in Japan, but has recently been gradually replaced with the ISO-specified Type A.

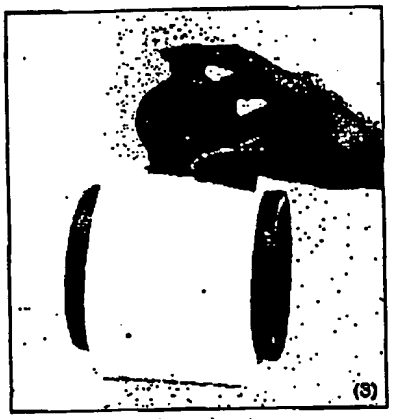
AVAILABLE HARDNESS MEASURING METHODS

(1) For optimum measured results, press a hardness tester vertically onto the surface of a horizontally oriented specimen, using a constant load. Keep in mind that tester must be pressed against the specimen with both hands (though the photo shows use of a single hand) in a proper position, aligning the graduated dial of the tester with the inspectors eyes. The instructions, "Hold a tester vertically" and "Place the test specimen on a flat surface," appear in applicable standards.

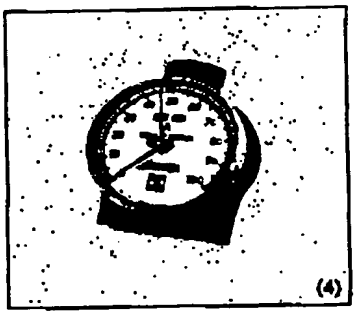

(1)

(2) The photo shows measurement by ASKER Models F(left) and FP(right). Gently place the tester vertically onto a specimen and take a reading.


(2)

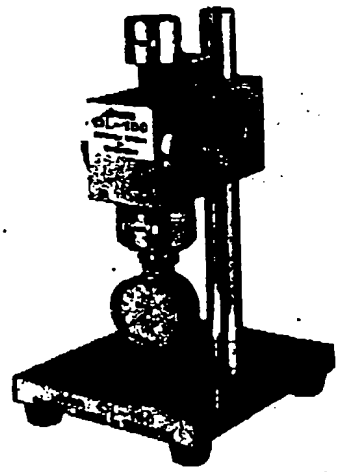

(3)

(3) The photo shows hardness measurement of rolled threads using ASKER Model C. Hardness of rolls may be measured by gently pressing the tester against the measuring surface. It also allows measurement of film rolls.


(4)

(4) For those samples exhibiting stress relaxation* or when it is difficult to take readings from the front, the two-pointer type is useful because there is a halt of the peak value-indicating pointer.(The two-pointer system is optional.)
*Those materials for which a reading decreases immediately after the indentor is pressed against the surface.

Constant Loader for Dur... CL-150 Series



A hardness tester may be used in combination with a constant loader providing a consistent pressing condition against specimens so as to allow steady and stable hardness measurement. This combined use eliminates deviations in measure results caused by differences in operating skills among individual inspectors.

Model	ASKER Durometer	Measuring Load
CL-150L	A, JA, B, C	1000g,1250g
CL-150H	D, JC	5000g
CL-150M	Any type of ASKER Durometers	1000g, 1250g,5000g

ASKER Model AL
- Normal rubber
- (Specifically for measurement of recessed surfaces)

Especially useful for recessed and/or smaller measuring areas. In addition to the standard Model AL, long presser foot types are available for another Model applications.

ASKER Model B
- Semi-rigid rubber
- Green ceramics

It uses the same spring load used in ASKER Model A. It adopts a conical indentor similar to that of Model D, so as to be applicable to harder measuring objects than can be measured by Model A.

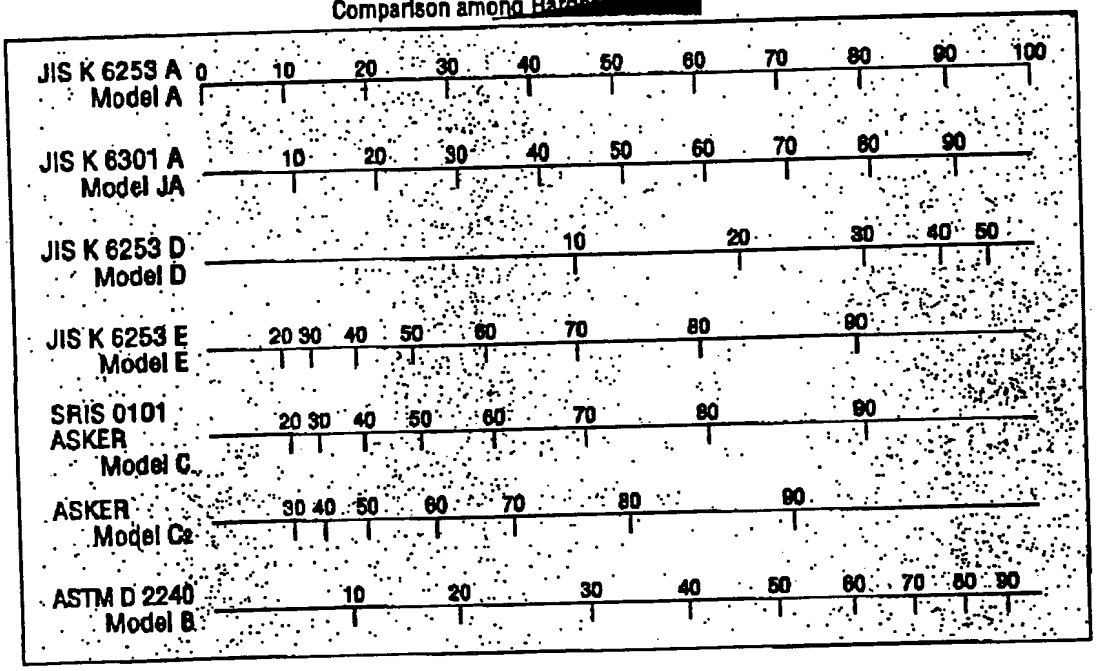
ASKER Model D
- Hard rubber
- Plastics

The most popular type for hard rubber all over the world, standardized in JIS K 6253, ISO 7619, ASTM D 2240, etc.

COMPARISON AMONG VARIOUS HARDNESS DATA

The table below is intended to provide a guideline for comparison of hardness values, but not for conversion among different hardness testers.
The relationship among hardness value obtained using different types of hardness testers cannot be easily and simply determined.
This is because hardness depends on a wide variety of factors such as sample composition, vulcanization conditions, viscoelasticity, dimensions of shape, and measuring temperature and humidity.

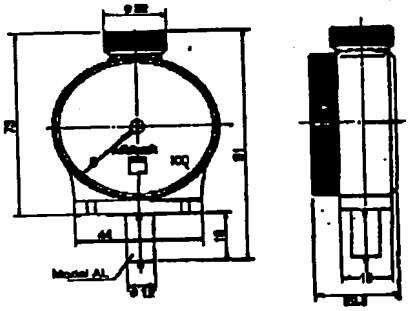
Comparison among Hardn



VARIOUS HARDNESS TEST METHODS, HARDNESS TESTERS USED, AND HARDNESS DATA EXPRESSION ACCORDING TO DIFFERENT STANDARDS

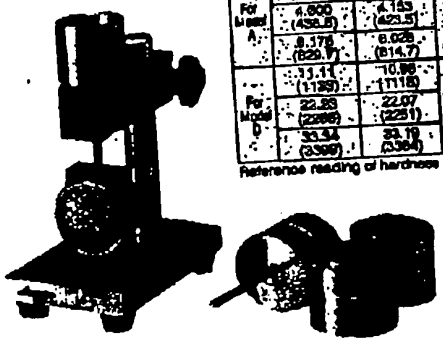
JIS K 6253-1997 Hardness Testing Methods for Vulcanized Rubber	Durometer hardness test	Type A durometer	A 50/8
		Type D durometer	D 50/8
		Type E durometer	E 50/8
JIS K 7215-1988 Testing Methods for Durometer Hardness of Plastics	Durometer hardness test	Type A durometer	HDA 50
		Type D durometer	HDD 50
ASTM D 2240-97 Standard Test Method for Rubber Property-Durometer Hardness	Durometer hardness test	Type A durometer	A/50/1
		Type D durometer	D/50/1
ISO 7619-1997(E) Rubber-Determination of indentation hardness by means of pocket hardness meters	Durometer hardness test	Type A durometer	A 50/1 or A/50
		Type D durometer	D 50/1 or D/50
ISO 868-1985(E) Plastics-Determination of indentation hardness by means of a durometer	Durometer hardness test	Type A durometer	A/50/1
		Type D durometer	D/50/1
JIS K 6301-1998 Physical Testing Methods for Vulcanized Rubber	Spring type hardness test	Type A	50Hs JIS A
		Type C	50Hs JIS C
SRIS 0101-1968 Physical Testing Method for Expanded Rubber	Spring type hardness test	Spring type hardness tester (ASKER C)	Measured hardness and used tester type will be reported.

● Outside Dimensions



Load Tester for Hard...

A load tester to check the characteristics of spring loads applied by hardness testers. With the force of weights it applies a specified reference load onto the indentor to check for correct correspondence among hardness reading of 25, 50 and 75 and relative spring loads. Different types of hardness testers provide different spring loads. Refer to the table below for selection of the optimum type.



	Testing Load N (g)	Actual Weight load N (g)	Hardness Tester Model	Hardness Tester Reference Reading	Applicable Hardness Tester Model	Applicable Hardness Tester Reference Reading
For Model A	2.425 (247.3)	2.278 (232.3)	A, B, E	25.0	JA C (JA1)	24.0 (24.5)
	4.900 (499.8)	4.753 (484.8)		50.0		47.8 (48.4)
	8.178 (829.7)	8.026 (814.7)		75.0		71.5 (72.3)
For Model D	11.11 (1133)	10.96 (1118)	D	25.0	JC DB	23.5
	22.58 (2268)	22.07 (2251)		50.0		48.2
	33.34 (3399)	33.19 (3384)		75.0		73.0

Reference reading of hardness tester correspond to test load.

INSPECTION OF HARDNESS TESTERS

A rubber hardness tester may be identified as functioning correctly through tests using an indentor extension tester to check the height of the indentor point and a load tester to check the spring load.

Indentor Extension Tester for Hard...

A gage to check the extension of an indentor on a hardness tester and the reading indicator mechanism. Applicable standards specify two extension, 2.50mm and 2.54mm for an indentor and the indentor testers are available for two models A and JA corresponding to the respective extension. Each indentor extension tester set is complete with two gages, one for hardness value of 50 and the other for hardness value of 2.

	Hardness Tester	Max. Height Indentor (mm)	Display of Extension Tester: 50 DEG	Display of Extension Tester: 2 DEG
Model A	A, B, D, E	2.80	H-1.250	H-2.450
Model JA	JA, JA1, JC, JC, DB	2.84	H-1.270	H-2.489

OTHER AVAILABLE HARDNESS TESTERS

Digital Hardness Test... for Rubber M...

Features peak holding and timer holding capabilities, as well as statistical processing in combination with an optional printer.

<Developed jointly with The Yokohama Rubber Co.,Ltd.>

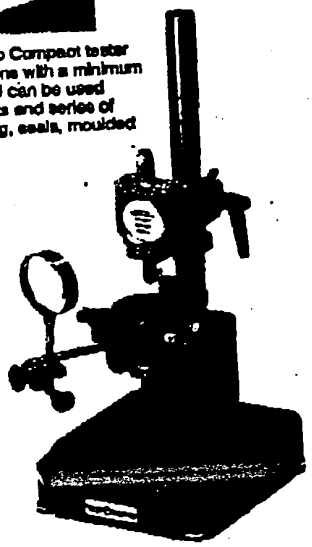
Micro Hardness Tester M...

Developed specifically for hardness measurement of small rubber parts and thin sheets which could not be property measured by previously existing hardness testers. Designed at allow full-automatic measurement, it is not affected by differences in operating skills among individual inspectors and it takes only 3 seconds or so to provide measured data for each sample, with an additional feature of statistical processing.

These materials may be correctly measured for their hardness.

IRHD Micro Com...

This Bareiss IRHD Micro Compact tester is available for specimens with a minimum thickness of 0.5mm and can be used for single measurements and series of measurements on O-ring, seals, moulded parts.



Advantages

- The tiring driving to the starting position of the measurement 100 is no longer necessary.
- The supporting table together with the sample is positioned upwards exactly by the use of the quick-adjustment lever, which has to be adjusted only one time.
- A two lined LC-display informs about the automatic running down of the measuring run and shows the result afterwards.

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